

Optical Mining at Mines – Precursory Results

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Introduction: In-Space Resource Utilization (ISRU) aims to decrease costs of space exploration and space travel- eventually leading to its habitation. Due to its capacitance of resources, and astronomical proximity, the Moon is currently a hot-target of ISRU activity. However, other extraterrestrial bodies are no less lucrative for ISRU. In the Near-Earth Object (NEO) population of asteroids alone, the United States Geological Survey (USGS) has estimated 11,000 Gtons of water and 61,000 Gtons of Iron that would be available for recovery [1]. Cannon et al have also estimated other element types that have been detected on asteroid bodies [2]. These resources, besides others that the moon may lack (e.g Carbon), will be a strategic asset in the development of both a global space economy, and more localized national strategic space developments [3].

The Optical Mining method, developed by TransAstronautica Corporation, aims to harness the power of the sun to extract resources from NEO's, and eventually other asteroid bodies. The objective of this method is to deliver high-powered focused solar light on the surface of a 1 - 10 m asteroid to cause optically induced thermal spallation- excavating the asteroid into small fragments, and simultaneously dehydrating the minerals to produce volatiles [4].

This poster presentation includes the current progress in the experiments aimed at understanding and advancing the Optical Mining Process. Experimental results and analysis of Optical Mining on a CI/CM type asteroid simulant are presented, alongside preliminary modeling results aimed to predict spallation phenomenon, and spall parameters, given the mechanical/chemical properties of a body.

References: [1]L.K. et al. *Feasibility Study for the Quant. Assessment of Mineral Resources in Asteroids*. [2] K.C. et al. *Planet. & Space Sci.*,225,105608. [3] A. J. & A. G. *Æther*, 4(2022),95-110. [4] J. S. et al. *American Society of Civil Engineers*,2016. 507-522